ADVANCE MATHS

for SSC

Algebra | Trigonometry | Geometry

SOLVE ADVANCE MATH IN JUST 30 DAYS

WITHOUT USE OF PEN PENCIL

by
(मैथ गुरु)
Sunil Kharub

TRICKY Maths by Sunil kharub Sir

IF $a+b+c=8$

$ab+bc+ca=20$

FIND $a^3+b^3+c^3-3abc=?$

Solution :- let $a=4$, $b=2$, $c=2$

$\therefore a^3+b^3+c^3-3abc=(a+b+c)(a^2+b^2+c^2-(ab+bc+ca))$

$=8(16+4+4-20)$

$=32$

IF $a^3b=abc=180$ FIND $c=?$

Solution :- $a^3b=180$

$abc=180$

let $a=1$, $b=180$, $c=1$

$\boxed{c=1}$

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TRICKY Maths by Sunil kharub Sir

The value of $\frac{1}{a^2+ax+x^2} + \frac{2ax}{a^4+a^2x^2+x^4} - \frac{1}{a^2-ax+x^2}$ is

a) 2 b) 1 c) -1 d) 0

Solution :- let $x=0$, we get

$$\frac{1}{a^2} + 0 - \frac{1}{a^2}$$

$$= 0$$ Ans. option (b)

$\frac{1}{0}$ ✗ Denominator 0 नहीं आना चाहिए

Well done is better than well said.

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IF $x = a + \frac{1}{a}$, $Y = a - \frac{1}{a}$, then FIND $x^4 + Y^4 - 2x^2Y^2$

Solution :- BASIC

$x = a + \frac{1}{a}$, $Y = a - \frac{1}{a}$

$x + Y = 2a$, $x - Y = \frac{2}{a}$

$\therefore x^2 - Y^2 = (x+Y)(x-Y)$

$= 2a * \frac{2}{a} = 4$

$\Rightarrow x^4 + Y^2 - 2x^2Y^2$

$= (x^2 - Y^2)^2 = (4)^2 = 16$ ANS.

TRICKY

$x = a + \frac{1}{a}$ $Y = a - \frac{1}{a}$

let $a = 1$

$\Rightarrow x = 2$, $Y = 0$

$\therefore x^4 + y^4 - 2x^2y^2$

$= 16 + 0 - 2 * 0$

$= 16$ ANS.

If you think you can do it, you can.

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If $x = \sqrt[3]{a+\sqrt{a^2+b^3}} + \sqrt[3]{a-\sqrt{a^2+b^3}}$, then $x^3+3bx = ?$

a) 0 b) a c) 2a d) 4

Solution :- Put $a=1$, $b=0$, we get

$$x = \sqrt[3]{1+\sqrt{1+0}} + \sqrt[3]{1-\sqrt{1+0}}$$

$$= \sqrt[3]{2} + \sqrt[3]{0}$$

$$x = \sqrt[3]{2} \Rightarrow \boxed{x^3 = 2}$$

Now $x^3+3bx = 2+3*0 = 2$ Ans. c

Put $a=1$ in options option c will give 2 so Ans. is (c)

TRICKY Maths by Sunil kharub Sir

If $2x = \sqrt{a} + \frac{1}{\sqrt{a}}$, $a > 0$, then $\frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}} = ?$

a) $\frac{1}{2}(a+1)$ B) $\frac{1}{2}(a-1)$

c) $a-1$ D) $a+1$

Solution:- let $a = 4$ [$\because a=1$ B, C both $= 0$]

$\Rightarrow 2x = 2 + \frac{1}{2} \Rightarrow x = \frac{5}{4}$

$$\frac{\sqrt{x^2-1}}{x-\sqrt{x^2-1}} = \frac{\sqrt{\frac{25}{16}-1}}{\frac{5}{4}-\sqrt{\frac{25}{16}-1}} = \frac{\frac{3}{4}}{\frac{5}{4}-\frac{3}{4}} = \frac{3}{2}$$

(B) Ans.

Put $a = 4$ in options, option B will give $3/2$

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IF $a^x = (x+y+z)^y$ FIND $x+y+z = ?$

$a^y = (x+y+z)^z$

$a^z = (x+y+z)^x$

1) 0 2) a 3) 2a 4) 1

Solution :- BASIC

multiply All the 3 eqn

$a^x \cdot a^y \cdot a^z = (x+y+z)^{x+y+z}$

$\Rightarrow a^{x+y+z} = (x+y+z)^{x+y+z}$

$\Rightarrow x+y+z = a$

TRICKY

let $x = y = z = 1$

$a = 3$

$\therefore x+y+z = 1+1+1 = 3$

option 2

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If $x+\frac{1}{y}=1$, $y+\frac{1}{z}=1$ Find $z+\frac{1}{x}=?$

Solution :- **BASIC**

$x+\frac{1}{y}=1 \Rightarrow x=1-\frac{1}{y}=\frac{y-1}{y}$

OR $\frac{1}{x}=\frac{y}{y-1}$ — (1)

$y+\frac{1}{z}=1 \Rightarrow \frac{1}{z}=1-y$

$\Rightarrow z=\frac{1}{1-y}$ — (2)

Adding (1) & (2), we get

$z+\frac{1}{x}=\frac{1}{1-y}+\frac{y}{y-1}$

$=\frac{1-y}{1-y}=1$ Ans.

TRICKY

$x+\frac{1}{y}=1$

let $x=2 \Rightarrow 2+\frac{1}{y}=1$

$\Rightarrow y=-1$

Also $y+\frac{1}{z}=1 \Rightarrow -1+\frac{1}{z}=1$

$\Rightarrow \frac{1}{z}=2 \Rightarrow z=\frac{1}{2}$

$\Rightarrow z+\frac{1}{x}=\frac{1}{2}+\frac{1}{2}=1$

Ans. — 1

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TRICKY Maths by Sunil kharub Sir

IF $a+\frac{1}{b}=1$, $b+\frac{1}{c}=1$ $\{a,b,c \neq 0\}$ find $abc=?$

Solution :- BASIC

$a+\frac{1}{b}=1$

$\Rightarrow ab+1=b \quad -(1)$

also $b+\frac{1}{c}=1$

$\Rightarrow ab+1+\frac{1}{c}=1$ [using (1)]

$\Rightarrow abc=-1$ ANS.

TRICKY

$a+\frac{1}{b}=1$ let $a=2$

$\Rightarrow 2+\frac{1}{b}=1 \Rightarrow b=-1$

Also $b+\frac{1}{c}=1$

$\Rightarrow -1+\frac{1}{c}=1$ [$\because b=-1$]

$\Rightarrow c=\frac{1}{2}$

$abc = 2 \times -1 \times \frac{1}{2}$

$= -1$ ANS.

TRICKY Maths by Sunil kharub Sir

IF $x^2 = y+2$, $y^2 = z+x$, $z^2 = x+y$ FIND $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z} = ?$

Solution BASIC

(I) $\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z}$

$= \frac{x}{x}\left(\frac{1}{1+x}\right) + \frac{y}{y}\left(\frac{1}{1+y}\right) + \frac{z}{z}\left(\frac{1}{1+z}\right)$

$= \frac{x}{x+x^2} + \frac{y}{y^2+y} + \frac{z}{z+z^2}$

$= \frac{x}{x+y+z} + \frac{y}{y+x+z} + \frac{z}{z+x+y}$

$= \frac{x+y+z}{x+y+z} = 1$ ANS.

TRICKY

let $x=2$
$y=2$
$z=2$

$\frac{1}{1+x} + \frac{1}{1+y} + \frac{1}{1+z}$

$\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = 1$

TRICKY Maths by Sunil kharub Sir

IF $\frac{x^2}{by+cz} = \frac{y^2}{cz+ax} = \frac{z^2}{ax+by} = 1$, FIND $\frac{a}{a+x} + \frac{b}{b+y} + \frac{c}{c+z} = ?$

Solution :- BASIC

$$\frac{a}{a+x} + \frac{b}{b+y} + \frac{c}{c+z}$$

$$= \frac{x}{x}\left[\frac{a}{a+x}\right] + \frac{y}{y}\left[\frac{b}{b+y}\right] + \frac{z}{z}\left[\frac{c}{c+z}\right]$$

$$= \frac{ax}{ax+x^2} + \frac{by}{by+y^2} + \frac{cz}{cz+z^2}$$

$$= \frac{ax}{ax+by+cz} + \frac{by}{by+ax+cz} + \frac{cz}{cz+ax+by}$$

$$= \frac{ax+by+cz}{ax+by+cz} = 1$$

TRICY

let $a = b = c = 1$

$x = y = z = 2$

$$\frac{1}{3} + \frac{1}{3} + \frac{1}{1+2} = 1$$

IF

If $x=16$, find $x^4-17x^3+17x^2-17x+14=?$

Solution :-

$$x^4-17x^3+17x^2-17x+14$$

$$=x^4-16x^3-x^3+16x^2+x^2-16x-x+14$$

Now Put $x=16$, we get

$$=16^4-16^4-16^3+16^3+16^2-16^2-16+14$$

$$=-16+14=-2 \quad \text{Ans.}$$

TRICKY Maths by Sunil kharub Sir

$a^2 - b^2 = (a+b)(a-b)$

We know $\operatorname{cosec}^2\theta - \cot^2\theta = 1$

$\Rightarrow (\operatorname{cosec}\theta - \cot\theta)(\operatorname{cosec}\theta + \cot\theta) = 1$

e.g. If $\operatorname{cosec}\theta - \cot\theta = 4$

$\Rightarrow \operatorname{cosec}\theta + \cot\theta = 1/4$ {∵ Product is 1}

$\sec^2\theta - \tan^2\theta = 1$

$\Rightarrow (\sec\theta - \tan\theta)(\sec\theta + \tan\theta) = 1$

IF $\sec\theta + \tan\theta = 3$ {∵ Product is 1}

$\Rightarrow \sec\theta - \tan\theta = 1/3$

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TRICKY Maths by Sunil kharub Sir

IF $\sec\theta + \tan\theta = 2$, FIND $\cos\theta = ?$

Solution :- $\sec\theta + \tan\theta = 2$ — (1)

$\Rightarrow \sec\theta - \tan\theta = 1/2$ — (2)

Adding (1) and (2), we get

$2\sec\theta = 5/2 \Rightarrow \sec\theta = 5/4$

$\therefore \cos\theta = 4/5$ Ans.

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IF $\operatorname{cosec}\theta - \cot\theta = \sqrt{5}-2$, FIND $\sin\theta$

Solution :- $\operatorname{cosec}\theta - \cot\theta = \sqrt{5}-2$ — (1)

$\Rightarrow \operatorname{cosec}\theta + \cot\theta = \sqrt{5}+2$ OR $\frac{1}{\sqrt{5}-2}$ — (1)

Adding (1) OR (1), we get

$2\operatorname{cosec}\theta = 2\sqrt{5}$ OR $\operatorname{cosec}\theta = \sqrt{5}$

$\Rightarrow \sin\theta = \frac{1}{\sqrt{5}}$ **Ans.**

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TRAILING ZERO's (अन्त में शून्य)

$5 \times 2 = 10$, 5 और 2 के जितने PAIR होंगे उतने ही TRAILING ZERO होते हैं।

e.g. $4 \times 5 \times 6 \times 7 \times 15$

$2^2 \times 5 \times 6 \times 7 \times 3 \times 5$

$2^2 \times 5^2 \rightarrow$ 2 TRAILING ZERO [2 और 5 के 2 PAIR]

e.g. $32 \times 125 \times 63 \times 20$

$\downarrow$

$2^5 \times 5^3 \times 7 \times 9 \times 2^2 \times 5$

$2^7 \times 5^4$ [दोनों में से जिसकी power कम होती है उतनी ही T. ZERO आयेगी]

Ans. 4 Trailing ZEROS

[coz only 4 PAIR OF 2×5]

Finding No. of Trailing ZERO in Factorial(!)

Note: In Factorial value of any Number 2's are present in bulk (थोक में), you have to focus only on 5's

Find the Number of TRAILING ZERO'S IN 1×2×3×4×5×6× ——— 23 OR 23! OR ⌊23

__Solution__ You have to calculate Number of 5's

$\frac{23}{5} = 4$ So ANS is 4 T.ZEROS

No of T. ZERDS IN 104! OR $\underline{\lfloor 104}$

Solution

$$\left[\frac{104}{5}\right] = 20$$

$$\left[\frac{20}{5}\right] = 4$$

ANS → 20+4 = 24

[ ] → इसको महत्तम आपको सिर्फ integer value देनी है।

OR

5	104
5	20 ← → 24
	4 ←

ANS. → 24

find the No. of zero's in 600! OR $\underline{\lfloor 600}$

Solution :-

$$\left[\frac{600}{5}\right] = 120$$

$$\left[\frac{120}{5}\right] = 24$$

$$\left[\frac{24}{5}\right] = 4$$

ANS. $120+24+4 = \underline{148}$

OR

5	600
5	120 ←
5	24 ←
	4 ←

ANS. $120+24+4$
$= 148$

find the No. of Trailing zeros in 308! or $\lfloor 308$

Solution :-

$$\left[\frac{308}{5}\right] = 61$$

$$\left[\frac{61}{5}\right] = 12$$

$$\left[\frac{12}{5}\right] = 2$$

Ans is → 61+12+2
→ 75 Ans

OR

5	308
5	61 ←
5	12 ← +
	2 ←

Ans 61+12+2 = 75

find No of Trailing zeros in 100! × 300!

Solution 100! × 300!
↓ ↓
24 ZERO 74 ZERO [∵ 100 × 140 = 14000 ↓ 3 ZERO]

ANS is 24 + 74 = (98)

find the No of Trailing zeros in 100! + 300!

Solution : 100! + 300!
↓ ↓
24 ZERO 74 ZERO

ANS. → (24) ZERO [जिसमें कम होती है वही ANS. होगा]

[∵ 240 + 1200 = 1640 → one ZERO]

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Find the Number of TRAILING ZERO in $1\times3\times5\times7\times9\times11\times$ ——— $\times 45$

Solution :- No trailing ZERO

क्योंकि सारी संख्याएँ विषम है। और 1 में 2

नहीं आएगा।

Find the No of ZERO in $2\times4\times6\times8\times\cdots\times100$

Solution :- $2^{50}[1\times2\times3\times4\times5\times$ ——— $\times50]$

$\left[\frac{50}{5}\right]=10$ ← $10+2=12$ ZERO

$\frac{10}{5}=2$

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$\# \; x+\frac{1}{x}=a$

$\Rightarrow x-\frac{1}{x}=\sqrt{a^2-4}$

IF $x-\frac{1}{x}=a$

$\Rightarrow x+\frac{1}{x}=\sqrt{a^2+4}$

$\# \;$ IF $x+\frac{1}{x}=3$, FIND $x^2-\frac{1}{x^2}$

Solution:-

$x+\frac{1}{x}=3 \Rightarrow x^2+\frac{1}{x^2}=7$

$\therefore x^2-\frac{1}{x^2}=\sqrt{7^2-4}=3\sqrt{5}$

$\# \;$ IF $x+\frac{1}{x}=4$, FIND $x^4-\frac{1}{x^4}$

Solution: $x+\frac{1}{x}=4 \Rightarrow x^2+\frac{1}{x^2}=14 \Rightarrow x^4+\frac{1}{x^4}=194$

$\therefore x^4-\frac{1}{x^4}=\sqrt{(194)^2-4}=\sqrt{37632}$ Ans.

$a = 99$, $b = 100$, $c = 101$

$\Rightarrow a^2 + b^2 + c^2 - ab - bc - ca = 3K^2$ [$\because$ K = common diff]

$= 3 \times 1$ [$\because D = 1$]

$= 3$

सुनील सर (मैथ गुरु)

IF $a = 999$, $b = 1000$, $c = 1001$

$\Rightarrow a^3 + b^3 + c^3 - 3abc = (a+b+c)3K^2$ [$K=1$]

$= 3000 \times 3 = 9000$ ANS

IF $a = 48$, $b = 50$, $c = 52$

$\therefore a^2 + b^2 + c^2 - ab - bc - ca = 3K^2$

$= 3 \times (2)^2$ [$\because K = 2$]

$= 12$ ANS.

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(1) $a^4 + \frac{1}{a^4} = 119$, FIND $a^3 - \frac{1}{a^3} = ?$

(2) IF $x + \frac{1}{x} = 3$, FIND $x = ?$

(3) FIND min^m value of $(x-3)(x-9)$

(4) IF $a^5 + a^4 + a^3 + a^2 + a + 1 = 0$, THEN FIND $a^{1032} + a^{1033} + a^{5054} + a^{5055} + 1 = ?$

(5) IF $x^2 + x = 5$, FIND $(x+3)^3 + \frac{1}{(x+3)^3} = ?$

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If you think you can do it, you can.

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Solution

1. $a^4+\frac{1}{a^4}=119$

$\Rightarrow a^2+\frac{1}{a^2}=11$

$\Rightarrow a-\frac{1}{a}=3$

$\therefore a^3-\frac{1}{a^3}=(3)^3+3*3$

$=36$ ANS.

2. $x+\frac{1}{x}=3$ —(1)

$\Rightarrow x-\frac{1}{x}=\sqrt{9-4}$ —(2)

$=\sqrt{5}$

Adding (1) & (2), we get

$2x=3+\sqrt{5} \Rightarrow x=\frac{3+\sqrt{5}}{2}$

4. Put $a=-1$

Ans is (1)

3. $(x-3)(x-9)=0$

$\Rightarrow x^2-12x+27=0$

Differentiating we get

$2x-12=0 \Rightarrow x=6$

put min^{m} value

$(6-3)(6-9)=-9$ ANS.

5. $x^2+x=5$

$\Rightarrow x^2+6x+9=5+9+5x$

$\Rightarrow (x+3)^2=5x+15+1$

$\Rightarrow (x+3)^2=5(x+3)-1$

Dividing by $(x+3)$

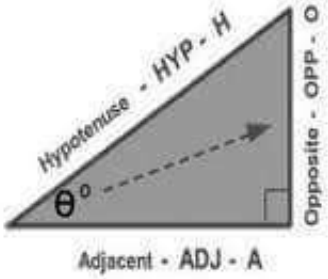
$\Rightarrow (x+3)+\frac{1}{(x+3)}=5$

$\therefore (x+3)^3+\frac{1}{(x+3)^3}=(5)^3-3*5$

$=110$ ANS.

Trigonometric Ratio

Trig Ratios – SOH CAH TOA



Name	Ratio	Expression
Sine	O / H	Sinθ
Cosine	A / H	Cosθ
Tangent	O / A	Tanθ

We use "SOH-CAH-TOA" to help us remember the Ratios

SOH is short for **Sine** = Opposite / Hypotenuse = O / H
CAH is short for **Cosine** = Adjacent / Hypotenuse = A / H
TOA is short for **Tangent** = Opposite / Adjacent = O / A

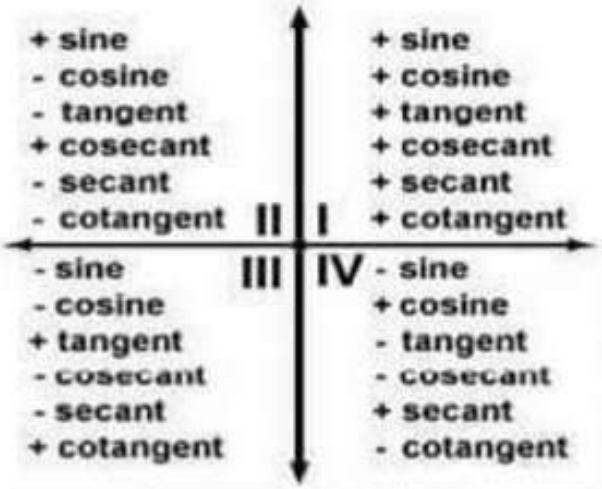
IMPORTANT TRIGONOMETRIC IDENTITIES

1. $\sin^2\theta + \cos^2\theta = 1$
2. $\sec^2\theta - \tan^2\theta = 1$
3. $\text{cosec}^2\theta - \cot^2\theta = 1$
4. $\text{cosec}\,\theta = \frac{1}{\sin\theta}$
5. $\sec\theta = \frac{1}{\cos\theta}$
6. $\cot\theta = \frac{1}{\tan\theta}$
7. $\tan\theta = \frac{\sin\theta}{\cos\theta}$
8. $\cot\theta = \frac{\cos\theta}{\sin\theta}$

IMPORTANT

1. $\sin C + \sin D = 2\sin\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$
2. $\sin C - \sin D = 2\cos\left(\frac{C+D}{2}\right).\sin\left(\frac{C-D}{2}\right)$
3. $\cos C + \cos D = 2\cos\left(\frac{C+D}{2}\right).\cos\left(\frac{C-D}{2}\right)$
4. $\cos C - \cos D = 2\sin\left(\frac{C+D}{2}\right).\sin\left(\frac{D-C}{2}\right)$
5. $\tan(A+B) = \frac{\tan A + \tan B}{1 - \tan A.\tan B}$
6. $\tan(A+B) = \frac{\tan A - \tan B}{1 + \tan A.\tan B}$
7. $\sin 2A = 2\sin A.\cos A = \frac{2\tan A}{1+\tan^2 A}$
8. $\cos^2 A = \cos^2 - \sin A = 2\cos^2 A - 1$
   $= 1 - 2\sin^2 A = \frac{1-\tan^2 A}{1+\tan^2 A}$
9. $\tan 2A = \frac{2\tan A}{1-\tan^2 A}$
10. $\sin 3A = 3\sin A - 4\sin^3 A$
11. $\cos 3A = 4\cos^3 A - 3\cos A$
12. $\tan 3A = \frac{3\tan A - \tan^3 A}{1 - 3\tan^2 A}$
13. $\sin(A+B) = \sin A.\cos B + \cos A \sin B$
14. $\sin(A+B) = \sin A.\cos B - \cos A \sin B$
15. $\cos(A+B) = \cos A.\cos B - \sin A \sin B$
16. $\cos(A-B) = \cos A.\cos B + \sin A \sin B$

Conversion of T ratios



- Few things which the above figure represents :
  There are 4 quadrants (shown with I II, III and IV).
  i) Quadrant I - 0° to 90°
  ii) Quadrant II - 90° to 180°
  iii) Quadrant III - 180° to 270°
  iv) Quadrant IV - 270° to 360°
- The mnemonic to remember which trigonometric function is positive in which quadrant is -**After School To College.** "**After**"is the first word of the sentence and hence represents the first quadrant. All trigonometric functions are positive in the 1st quadrant. Second initial is "S" which represents sin (indicating sin/cosec are positive in 2nd quadrant). Third initial is "T" which represents tan (indicating tan/cot are positive in 3rd quadrant). Fourth initial is "C" which represents cos (indicating cos/sec are positive in 4th quadrant).

NOTE:- All trigonometric ratio are positive in the 1st quadrant
sin/cosec are positive in 2nd quadrant (sin and cosec are reciprocal of each other and hence their signs are same)
tan/cot are positive in 3rd quadrant
cos/sec are positive in 4th quadrant

VALUE PUTTING

How to assume value -

1. When you don't have to deal with fractions you can assume $\theta = 90$ or 0
   E.g. $(a\cos\theta - b\sin\theta)$
2. When fraction is given and putting θ = 90 or 0 is making denominator zero, then you can go with $\theta = 45$.
3. Don't assume a value for θ at which the trigonometric function is not de fined. E.g. When $\tan\theta$ is given, you can't assume $\theta = 90$.
4. When you are assuming two angles, go with A = 60 and B = 30

Note :- These are not hard and fast rules and you can assume any value you like, but make sure denominator $\neq 0$. Sometimes when you assume θ, you

may end up with two options(say A and B) that are giving similar results (but two options will still get eliminated, i.e., C and D). Now change the value of θ and check only A and B.

NOTE:- You only need to memorize the values of sin, cos and tan (for $\theta = 0^0$, 30^0, 45^0 and 60^0,90^0). The values of cosec, sec θ and cot θ can be obtained by reciprocating $\sin\theta$, $\cos\theta$ and tan respectively.

Value of Trigonometric Ratios

	0°	30°	45°	60°	90°
Sin	0	$\frac{1}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{\sqrt{3}}{2}$	1
Cos	1	$\frac{\sqrt{3}}{2}$	$\frac{1}{\sqrt{2}}$	$\frac{1}{2}$	0
Tan	0	$\frac{1}{\sqrt{3}}$	1	$\sqrt{3}$	∞
Cosec	∞	2	$\sqrt{2}$	$\frac{2}{\sqrt{3}}$	1
Sec	1	$\frac{2}{\sqrt{3}}$	$\sqrt{2}$	2	∞
Cot	∞	$\sqrt{3}$	1	$\frac{1}{\sqrt{3}}$	0

Trignometric Ratio of Specific Angles

1. $\sin 18^0 = \left(\frac{\sqrt{5}-1}{4}\right) = \cos 72^0.$
2. $\cos 18^0 = \frac{\sqrt{10+2\sqrt{5}}}{4} = \sin 72^0.$
3. $\cos 36^0 = \left(\frac{\sqrt{5}+1}{4}\right) = \sin 54^0.$
4. $\sin 36^0 = \left(\frac{\sqrt{10-2\sqrt{5}}}{4}\right) = \cos 54^0.$
5. $\sin 15^0 = \frac{\sqrt{3}-1}{2\sqrt{2}} = \cos 75^0.$
6. $\cos 15^0 = \frac{\sqrt{3}+1}{2\sqrt{2}} = \sin 75^0.$
7. $\sin 22\frac{1^0}{2} = \frac{\sqrt{2-\sqrt{2}}}{2} = \cos 67\frac{1^0}{2}$
8. $\cos 22\frac{1^0}{2} = \frac{\sqrt{2+\sqrt{2}}}{2} = \sin 67\frac{1^0}{2}.$

HIT & TRIAL METHOD

- The simplified value of $(1+\cot\theta-\operatorname{cosec}\theta)(1+\tan\theta+\sec\theta)$
(a) 0 (b) 1 (c) 2 (d) -1

Solution:-(c)

Put $\theta = 45^0$

$(1+1-\sqrt{2})$ $(1+1+\sqrt{2})$

$= (2-\sqrt{2})(2+\sqrt{2}) = 2$

- The simplified value of $(\sec x \sec y + \tan x \tan y)^2 - (\sec x \tan y + \tan x \sec y)^2$
(a) –1 (b) 0 (c) $\sec^2 x$ (d) 1

Solution:- (d)

Put $x = y = 45^0$

$(\sec 45^0 \sec 45^0 + \tan 45^0 \tan 45^0)^2$

$-(\sec 45^0 \tan 45^0 + \tan 45^0 \sec 45^0)^2$

$= \left(\sqrt{2}\times\sqrt{2}+1\right)^2 - \left(\sqrt{2}+\sqrt{2}\right)^2$

$=9-\left(2\sqrt{2}\right)^2=1$ **Ans. is (d)**

- If $a=\text{cosec}\theta-\sin\theta$
  $b=\sec\theta-\cos\theta$
  Find the value of $a^2b^2(a^2+b^2+3)$

Solution:-

Put $\theta=45^0$

$a=\text{cosec}\,45^0-\sin 45^0=\sqrt{2}-\frac{1}{\sqrt{2}}$

$=\frac{1}{\sqrt{2}}$

$b=\sec 45^0-\cos 45^0$

$=\sqrt{2}-\frac{1}{\sqrt{2}}=\frac{1}{\sqrt{2}}$

put a & b

$a^2b^2(a^2+b^2+3)=$

$\frac{1}{2}\times\frac{1}{2}\left(\frac{1}{2}+\frac{1}{2}+3\right)=\frac{1}{4}\times 4=$ **1 Ans.**

- If $x=a(\sin\theta+\cos\theta)$
  $y=b(\sin\theta-\cos\theta)$, then find
  the value of $\frac{x^2}{a^2}+\frac{y^2}{b^2}$ is :
  (a) 0 (b)1 (c) 2 (d)–2

Solution :- (b)

Put $\theta=90^0\Rightarrow x=a(1+0)=a$

$y=b(0-1)=-b$

$\Rightarrow\frac{x^2}{a^2}+\frac{y^2}{b^2}=\frac{a^2}{a^2}+\frac{b^2}{b^2}=1$

- If $a\sin\theta+b\cos\theta=c$, then value of $a\cos\theta-b\sin\theta$ is :
  (a) $\pm\sqrt{a^2+b^2+c^2}$ (b) $\pm\sqrt{c^2+a^2-b^2}$
  (c) $\pm\sqrt{a+b-c}$ (d) $\pm\sqrt{a^2+b^2-c^2}$

Solution :- (d)

Assume $\theta=90^0$

then $a\times 1+b\times 0=c\Rightarrow a=c$

also $a\cos\theta-b\sin\theta=a.0-b.1=-b$

put $a=c$ in all the options

option (4) gives –b so d

- If $\tan A=n\tan B$ and $\sin A=m\sin B$, then the value of $\cos^2A$
  (a) $\frac{m^2+1}{n^2+1}$ (b) $\frac{m^2-1}{n^2-1}$
  (c) $\frac{m^2+1}{n^2-1}$ (d) $\frac{m^2-1}{n^2+1}$

Solution :-(b)

Let $A=60^0$, $B=30^0$, then

$n=3$, $m=\sqrt{3}$ also

$\cos^2A=\cos^2 60^0=\frac{1}{4}$

Now put $n=3$, $m=\sqrt{3}$ in all the options only option (B) will given $\frac{1}{4}$ (B) is **Ans.**

- The value of
  $\frac{\sin A}{1+\cos A}+\frac{\sin A}{1+\cos A}+\frac{\sin A}{1-\cos A}$ is
  $(0<A<90)$
  (a) 2 cosec A (b) 2 sec A
  (c) 2 sinA (d) 2 cos A

Solution :-(a)

Put $A=30^0$, the value of given expression is

If $(\mu\cos\theta-\sqrt{3})^2+(\mu\sin\theta-1)^2=0$ then the value of $\frac{\mu\tan\theta+\sec\theta}{\mu\sec\theta+\tan\theta}$ is

a). $\frac{4}{5}$ b). $\frac{3}{5}$ c). $\frac{\sqrt{3}}{4}$ d). $\frac{\sqrt{5}}{4}$

Solution $(\mu\cos\theta-\sqrt{3})^2+(\mu\sin\theta-1)^2=0$

$\Rightarrow \mu\cos\theta=\sqrt{3}$ & $\mu\sin\theta=1$ $\left[\because a^2+b^2=0 \Rightarrow a=0, b=0\right]$

dividing $\cot\theta=\sqrt{3} \Rightarrow \theta=30^\circ$

also $\mu\cos\theta=\sqrt{3} \Rightarrow \mu\cos30^\circ=\sqrt{3}$

$\Rightarrow \mu\cdot\frac{\sqrt{3}}{2}=\sqrt{3} \Rightarrow \mu=2$

$\therefore \frac{\mu\tan\theta+\sec\theta}{\mu\sec\theta+\tan\theta}=\frac{\mu\tan30^\circ+\sec30^\circ}{\mu\sec30^\circ+\tan30^\circ}$

$=\frac{\frac{2}{\sqrt{3}}+\frac{2}{\sqrt{3}}}{\frac{4}{\sqrt{3}}+\frac{1}{\sqrt{3}}}=\frac{4}{5}$ (A) is correct

the simplified value of $(1+\cot\theta-\operatorname{cosec}\theta)(1+\tan\theta+\sec\theta)$ equal to

Solution put $\theta=45^\circ$

$(1+1-\sqrt{2})(1+1+\sqrt{2})=(2-\sqrt{2})(2+\sqrt{2})$

$=(2)$

If $\sec\theta = x + \frac{1}{4x}$ $[0° < \theta < 90°]$, then $\sec\theta + \tan\theta$ equal to.

a). $\frac{x}{2}$ b). $2x$ c). x d). $\frac{1}{2x}$

Solution Put $x = 1$

$$\sec\theta = 1 + \frac{1}{4} = \frac{5}{4} = \frac{H}{B}$$

$$\Rightarrow \tan\theta = \frac{P}{B} = \frac{3}{4}$$

$$\Rightarrow \sec\theta + \tan\theta = \frac{5}{4} + \frac{3}{4} = 2 = 2x$$

[www.competitionking.com] [$\because x = 1$]

The simplified value of

$(\sec x \sec y + \tan x \tan y)^2 - (\sec x \tan y + \tan x \sec y)^2$

(a) -1 b). 0 c) $\sec^2 x$ (d) 1

Solution :→ Put $x = y = 45°$

$$(\sec 45° \sec 45° + \tan 45° \tan 45°)^2 - (\sec 45° \tan 45° + \tan 45° \sec 45°)^2$$

$$= (\sqrt{2} \times \sqrt{2} + 1)^2 - (\sqrt{2} + \sqrt{2})^2$$

$$= 9 - (2\sqrt{2})^2 = (1) \quad \text{ANS. IS (d)}$$

If $x\cos\theta - \sin\theta = 1$, then $x^2 + (1+x^2)\sin\theta$ equals

(a) 1 b) -1 (c) 0 d) 2

Solution :→ let $\theta = 0°$

$\Rightarrow x\cdot 1 - 0 = 1 \Rightarrow x = 1$

∴ $x^2 + (1+x^2)\sin\theta = 1 + (1+1)*0 = 1$

(a) is correct.

If $\tan^2\alpha = 1 + 2\tan^2\beta$ (α, β are acute) then $\sqrt{2}\cos\alpha - \cos\beta$ is equal to

a) 0 b) $\sqrt{2}$ c) 1 d) -1

Solution put $\beta = 45°$ and $\alpha = 60°$

this will satisfy the given condition

$\tan^2 60° = 1 + 2\tan^2\beta$

$(\sqrt{3})^2 = 1 + 2$

$3 = 3$

∴ $\sqrt{2}\cos\alpha - \cos\beta = \sqrt{2}\cos 60° - \cos 45°$

$= \sqrt{2} \times \frac{1}{2} - \frac{1}{\sqrt{2}} = 0.$

(a) is Ans.

If $2y\cos\theta - x\sin\theta = 0$ & $2x\sec\theta - y\operatorname{cosec}\theta = 3$, then the value of $x^2 + 4y^2$ is

(A) 0 (B) 2 (C) 4 (D) 8

Sol. put $\theta = 45^\circ$

$$\frac{2y}{\sqrt{2}} - \frac{x}{\sqrt{2}} = 0 \Rightarrow 2y - x = 0$$

$$\Rightarrow 2y = x$$

also $2x \cdot \sqrt{2} - y\sqrt{2} = 3 \Rightarrow 2x - y = 3/\sqrt{2}$

OR $4y - y = 3/\sqrt{2}$ [$\because 2y = x$]

OR $3y = 3/\sqrt{2} \Rightarrow y = \frac{1}{\sqrt{2}} \Rightarrow x = 2y = \sqrt{2}$

$\therefore x^2 + 4y^2 = 2 + 4 \times \frac{1}{2} = 4$ (C)

Find the value of

$$\frac{\cot x}{\cot x - \cot 3x} + \frac{\tan x}{\tan x - \tan 3x}$$

(A) 0 (B) 1 (C) -1 (D) 2

Solution Put $\theta = 15^\circ$

$$\frac{\cot 15^\circ}{\cot 15^\circ - \cot 45^\circ} + \frac{\tan 15^\circ}{\tan 15^\circ - \tan 45^\circ}$$

$$\frac{2+\sqrt{3}}{1+\sqrt{3}} + \frac{2-\sqrt{3}}{1-\sqrt{3}} = (1)$$

(B) is Ans.

$\cot 15^\circ = 2+\sqrt{3}$

$\tan 15^\circ = 2-\sqrt{3}$

If $2y\cos\theta - x\sin\theta = 0$ & $2x\sec\theta - y\operatorname{cosec}\theta = 3$, then the value of $x^2 + 4y^2$ is

(A) 0 (B) 2 (C) 4 (D) 8

Sol. put $\theta = 45^\circ$

$$\frac{2y}{\sqrt{2}} - \frac{x}{\sqrt{2}} = 0 \Rightarrow 2y - x = 0$$

$$\Rightarrow 2y = x$$

also $2x \cdot \sqrt{2} - y\sqrt{2} = 3 \Rightarrow 2x - y = 3/\sqrt{2}$

OR $4y - y = 3/\sqrt{2}$ [$\because 2y = x$]

OR $3y = 3/\sqrt{2}$ $\Rightarrow y = \frac{1}{\sqrt{2}} \Rightarrow x = 2y = \sqrt{2}$

$\therefore x^2 + 4y^2 = 2 + 4 \times \frac{1}{2} = 4$ (C)

Find the value of

$$\frac{\cot x}{\cot x - \cot 3x} + \frac{\tan x}{\tan x - \tan 3x}$$

(A) 0 (B) 1 (C) -1 D) 2

Solution Put $\theta = 15^\circ$

$$\frac{\cot 15^\circ}{\cot 15^\circ - \cot 45^\circ} + \frac{\tan 15^\circ}{\tan 15^\circ - \tan 45^\circ}$$

$$\frac{2+\sqrt{3}}{1+\sqrt{3}} + \frac{2-\sqrt{3}}{1-\sqrt{3}} = (1)$$

(B) is Ans.

$\cot 15^\circ = 2+\sqrt{3}$

$\tan 15^\circ = 2-\sqrt{3}$

If $\frac{\cos\alpha}{\cos\beta} = a$ and $\frac{\sin\alpha}{\sin\beta} = b$ then the value of ~~a and b~~ $\sin^2\beta$

(a) $\frac{a^2+1}{a^2-b^2}$ (b) $\frac{a^2-b^2}{a^2+b^2}$ (c) $\frac{a^2-1}{a^2-b^2}$ (d) $\frac{a^2-1}{a^2+b^2}$

Solution :→ let $\alpha = 30°$, $\beta = 60°$

then $a = \sqrt{3}$ & $b = \frac{1}{\sqrt{3}}$

also $\sin^2\beta = \sin^2 60° = \frac{3}{4}$

Now put $a = \sqrt{3}$ & $b = \frac{1}{\sqrt{3}}$ in options

check option (c) will give 3/4

so C is Ans.

If θ is +ve acute angle and $3(\sec^2\theta + \tan^2\theta) = 5$, then the value of $\cos 2\theta$ is

a). $\frac{1}{\sqrt{2}}$ b). 1 c). $\frac{1}{2}$ d). $\frac{\sqrt{3}}{2}$

Solution $\sec^2\theta + \tan^2\theta = \frac{5}{3}$

we know $\sec^2\theta - \tan^2\theta = 1$

adding both $2\sec^2\theta = 8/3 \Rightarrow \sec^2\theta = 4/3$

$\sec\theta = \frac{2}{\sqrt{3}} \Rightarrow \theta = 30°$

$\cos 2\theta = \cos 60° = 1/2$

If $\tan A = n \tan B$ and $\sin A = m \sin B$ then the value of $\cos^2 A$

(a) $\frac{m^2+1}{n^2+1}$ (b) $\frac{m^2-1}{n^2-1}$ (c) $\frac{m^2+1}{n^2-1}$ (d) $\frac{m^2-1}{n^2+1}$

Solution let $A = 60°$, $B = 30°$

then $n = 3$, $m = \sqrt{3}$

also $\cos^2 A = \cos^2 60° = \frac{1}{4}$

Now put $n=3$, $m=\sqrt{3}$ in all the options only option (B) will give $\frac{1}{4}$

(B) is Ans.

value of $\frac{\sin A}{1+\cos A} + \frac{\sin A}{1-\cos A}$ is $(0 < A < 90)$

(a) $2\operatorname{cosec} A$ (b) $2\sec A$ (c) $2\sin A$ (d) $2\cos A$

Solution Put $A = 30°$

the value of given expression is

$$\frac{\frac{1}{2}}{1+\sqrt{3}/2} + \frac{\frac{1}{2}}{1-\sqrt{3}/2} = 2-\sqrt{3}+2+\sqrt{3} = 4$$

Now Put $A = 30°$ in options only 4 option will give $4 = 2\operatorname{cosec} 30°$

$= 4$

(A) → ans

Note → Dont put $A = 45°$ in this question option (A) and (B) will give same value

If $ax + by = m$

$bx - ay = n$

then $(a^2+b^2)(x^2+y^2) = m^2+n^2$

e.g. If $\sin x + \cos x = \frac{17}{13}$

then find $\sin x - \cos x$

Sol. $\sin x + \cos x = \frac{17}{13}$

let $\sin x - \cos x = m$

by applying above theorem

$a=1, b=1$

$(1^2+1^2)(\sin^2 x + \cos^2 x) = \frac{289}{169} + m^2$

$\Rightarrow 2(1) = \frac{289}{169} + m^2$

$\Rightarrow m^2 = 2 - \frac{289}{169} = \frac{49}{169}$

$\Rightarrow m = \pm 7/13$

Q.1. If $\operatorname{cosec}\theta + \cot\theta = 3$, find $\tan\theta$?

Sol. $\operatorname{cosec}\theta + \cot\theta = 3$ —(1)

$\Rightarrow \operatorname{cosec}\theta - \cot\theta = 1/3$ —(2)

Sub. (1) From (2), we get

$2\cot\theta = 3 - 1/3 = 8/3$

$\Rightarrow \cot\theta = 8/6 = 4/3 \Rightarrow \tan\theta = 3/4$

Q.2. If $\sec\theta - \tan\theta = \sqrt{5} - 2$ find $\cos\theta$?

Sol. $\sec\theta - \tan\theta = \sqrt{5} - 2$ —(1)

$\Rightarrow \sec\theta + \tan\theta = \frac{1}{\sqrt{5}-2} = \sqrt{5} + 2$ —(11)

Adding (1) & (11), we get

$2\sec\theta = 2\sqrt{5} \Rightarrow \sec\theta = \sqrt{5}$

$\therefore \cos\theta = 1/\sqrt{5}$

Q.3. If $\sec\theta + \tan\theta = p$, find $\cos\theta$?

1. $\sin\theta \sin 2\theta \sin 4\theta = \frac{1}{4}\sin 3\theta$

$\cos\theta \cos 2\theta \cos 4\theta = \frac{1}{4}\cos 3\theta$

$\tan\theta \tan 2\theta \tan 4\theta = \tan 3\theta$

2. $\sin\theta \sin(60-\theta) \sin(60+\theta) = \frac{1}{4}\sin 3\theta$

$\cos\theta \cos(60-\theta) \cos(60+\theta) = \frac{1}{4}\cos 3\theta$

$\tan\theta \tan(60-\theta) \tan(60+\theta) = \tan 3\theta$

Q. $\sin 10^\circ \sin 30^\circ \sin 20^\circ \sin 40^\circ$

$= \frac{1}{2}\sin 10^\circ \sin 20^\circ \sin 40^\circ = \frac{1}{2}\times\frac{1}{4}\times\sin 30^\circ$

[SUNIL SIR KI CLASS 9728435915] $= \frac{1}{2\times 4}\times\frac{1}{2} = \frac{1}{16}$

Q. $\cos 12^\circ \cos 48^\circ \cos 72^\circ$

$= \cos 12^\circ \cos(60-12^\circ) \cos(60+12)$

$= \frac{1}{4}\cos 36^\circ = \frac{1}{4}\frac{\sqrt{5}+1}{4} = \frac{\sqrt{5}+1}{16}$

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Q ⇒ If $a = \operatorname{cosec}\theta - \sin\theta$

$b = \sec\theta - \cos\theta$

Find the value of $a^2b^2(a^2+b^2+3)$

Sol. ⇒ Put $\theta = 45^\circ$

$a = \operatorname{cosec}45^\circ - \sin 45^\circ = \sqrt{2} - \frac{1}{\sqrt{2}}$

$= \frac{1}{\sqrt{2}}$

$b = \sec 45^\circ - \cos 45^\circ$

$= \sqrt{2} - \frac{1}{\sqrt{2}} = \frac{1}{\sqrt{2}}$

put a & b

$a^2b^2(a^2+b^2+3) = \frac{1}{2}\times\frac{1}{2}\left(\frac{1}{2}+\frac{1}{2}+3\right)$

$= \frac{1}{4}\times 4 = 1$

[SUNIL SIR KI CLASS]

Q. If $a^3 = \operatorname{cosec}\theta - \sin\theta$

$b^3 = \sec\theta - \cos\theta$

find $a^2b^2(a^2+b^2) = ?$

By sunil The math guru

P (B) (H)

(3) sinθ + (4) cosθ = (5)

If co-eff of sin & cos makes Triplet

then → Co-eff with sin becomes P

→ ——— ——— cos becomes B

$\Rightarrow \tan\theta = P/B = 3/4$

If $7\cos\theta + 24\sin\theta = 25$

as 7, 24, 25 are Triplet

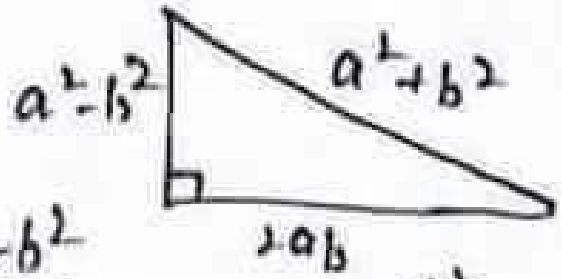
$\therefore P \to 24 \quad B \to 7$

$\Rightarrow \tan\theta = 24/7$

$(a^2-b^2)\sin\theta + 2ab\cos\theta = a^2+b^2$

$P = a^2-b^2$

$B = 2ab$



$\Rightarrow \tan\theta = \frac{a^2-b^2}{2ab}$

By math guruu

⑧ Find the max^{m} value and min^{m} value of $\sin(\sin x)$

Solution :→ As we know

$$-1 \le \sin x \le 1$$

$$\Rightarrow \sin(-1) \le \sin x \le \sin 1$$

$$\Rightarrow -\sin 1 \le \sin x \le \sin 1$$

⑨ Find the max^{m} and min^{m} value of $\sin^{113}\theta \cos^{113}\theta$

Solution $\sin^{113}\theta \cos^{113}\theta$

$$= [\sin\theta \cos\theta]^{113}$$

$$= \left[\frac{2\sin\theta \cos\theta}{2}\right]^{113} = \frac{1}{2^{113}} \sin^{113} 2\theta$$

$$\min^{m} = 0$$

$$\max = \frac{1}{2^{113}}$$

⑨ If $(x\cos\theta-\sqrt{3})^2+(x\sin\theta-1)^2=0$

find $\dfrac{x\tan\theta+\sec\theta}{x\sec\theta+\tan\theta}$

Sol Put $\theta=30^\circ$

$$\left(x\times\frac{\sqrt{3}}{2}-\sqrt{3}\right)^2+\left(x\frac{1}{2}-1\right)^2=0$$

$$3\left(\frac{x}{2}-1\right)^2+\left(\frac{x}{2}-1\right)^2=0$$

$$4\left(\frac{x}{2}-1\right)^2=0 \Rightarrow \frac{x}{2}-1=0 \Rightarrow x=2$$

Put $\dfrac{2\times\tan30^\circ+\sec30^\circ}{2\times\sec30^\circ+\tan30^\circ}$

$$\frac{\frac{2}{\sqrt{3}}+\frac{2}{\sqrt{3}}}{2\times\frac{2}{\sqrt{3}}+\frac{1}{\sqrt{3}}}=\frac{4/\sqrt{3}}{5/\sqrt{3}}=4/5$$

$$=\frac{4}{5}$$

If Power of Sin and Cos are Even then max^m value is always 1.

$\sin^m\theta + \cos^n\theta \leq 1$ if m, n are even

eg $\sin^2\theta + \cos^4\theta \leq 1$

To find min^m value in these type put $\theta = 45°$

eg $\sin^2\theta + \cos^4\theta$

max^m is 1 Eve as Power are Even

For min^m put $\theta = 45°$

$\sin^2 45° + \cos^4 45° = \frac{1}{2} + \frac{1}{4} = \frac{2+1}{4} = \frac{3}{4}$

eg $\sin^6\theta + \cos^6\theta$

max^m = 1 as Power is Even

For min^m put $\theta = 45°$

$\sin^6 45° + \cos^6 45°$

$\frac{1}{8} + \frac{1}{8} = \frac{2}{8} = \frac{1}{4}$ min^m value

Very Important Concept

If $A+B=C$ then

$$\tan(A+B) = \tan C \Rightarrow \frac{\tan A+\tan B}{1-\tan A\tan B} = \tan C$$

$$\Rightarrow \tan A+\tan B = \tan C - \tan A\tan B\tan C$$

$$\Rightarrow \boxed{\tan A\tan B\tan C = \tan C - \tan A - \tan B}$$

Eg Find the value of

$$\tan 5x - \tan 2x - \tan 3x$$

Solution as $5x = 2x+3x$ so, we can apply above theorem

So

$$\tan 5x - \tan 2x - \tan 3x = \tan 5x \tan 2x \tan 3x$$

(Q) ⟹ If $\frac{\cos^4\alpha}{\cos^2\beta} + \frac{\sin^4\alpha}{\sin^2\beta} = 1$

Find $\sin^4\alpha + \sin^4\beta$

(a) $2\sin^2\alpha \sin^2\beta$ (c) $\sin\alpha \sin\beta$

(b) $\sin^2\alpha \sin^2\beta$ (d) $2\sin\alpha \sin\beta$

Solution ⟹ If we put $\alpha = \beta$

then $\frac{\cos^4\alpha}{\cos^2\alpha} + \frac{\sin^4\alpha}{\sin^2\alpha}$.

$= \cos^2\alpha + \sin^2\alpha = 1$

satisfies so

$\sin^2\alpha + \sin^4\beta = \sin^4\alpha + \sin^4\alpha =$

$2\sin^4\alpha$

put also $\alpha = \beta$ in options

option 1 $= 2\sin^4\alpha$ (so)

opt (1) is Ans

Tricky Questions

(8) If $X + Y = Z$ then find the value of $\cos^2 x + \cos^2 y + \cos^2 z$

(a) $1 + 2 \sin x \cos y \sin z$

(b) $1 + 2 \sin y \cos x \sin z$

(c) $1 - 2 \cos x \cos y \cos z$

(d) $1 + 2 \cos x \cos y \cos z$

Sol. Put $x = 0, y = 0, z = 0$

we get $\cos^2 0 + \cos^2 0 + \cos^2 0 = 1 + 1 + 1 = 3$

Now put the value of x, y, z in option

also (d) option

$1 + 2 \times 1 \times 1 \times 1 = (3)$

so (d) is Answer

(a) Find the max^m and min^m value of

$\sin^2\theta + \cos^4\theta$

Solution $\sin^2\theta + \cos^4\theta$

$= 1 - \cos^2\theta + \cos^4\theta$

$= 1 - \cos^2\theta [1 - \cos^2\theta]$

$= 1 - \cos^2\theta \sin^2\theta$

$= 1 - \frac{4\cos^2\theta \sin^2\theta}{4}$

$= 1 - \frac{\sin^2 2\theta}{4}$ $\left[\because \sin 2\theta = 2\sin\theta\cos\theta\right]$

max^m when $\sin^2 2\theta$ is min^m $= 0$

max^m $= 1 - 0 = (1)$ max^m

min^m when $\sin 2\theta$ is max^m

$1 - \frac{1}{4} = (3/4)$ min^m

Note If power of sin and cos is even max^m value is always (1)